

“ St. *Jerom*, in his Epistle to *Leta*, writes, A few Years ago, your Cozen *Gracchus*, a Name of “ *Patrician* Quality, when he was Præfect of the “ City, destroy’d, broke, and burnt the Cave of *Mithras*.” This was at *Rome*, and about the Year 378. Not long after, we may well imagine, your *Roman* Præfect of *York* followed his Example, and demolished the subterranean Temple in *Micklegate*; where this Sculpture of him was found.

Stamford, July 30, 1747.

WM. STUKELEY.

VII. *Part of a Letter from James Mounsey, M. D. Physician to the Czarina's Army, to Mr. Henry Baker, F. R. S. concerning the Russia Castor, the Baths at Carlsbad, the Salt-mines near Cracau, and various other Notices.*

Dear Sir,

Riga, July 1, 1749.

Read Nov. 23. 1749. I AM highly sensible of the Honour the Royal Society does me, in taking Notice of what I communicated to you, and only wish I were as capable as I am zealous to contribute any thing that might be satisfactory and acceptable to that illustrious Body, for which I have the greatest Veneration.

I cannot as yet perfectly answer your Enquiries concerning the *Russia* Castor which is not all from the same Animal, some of it being the *Prostatæ*, *Testes*, and Kidneys of the Beaver, gathered in the Spring; but the true Sort comes from quite a different

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Creature,

Creature, which resembles a wild Goat, just by whose Navel the Castor is found like two Glands. This I am assured from People who have seen it on the Spot; but as they are quite unacquainted with natural History and Anatomy, we must not trust to them too much: I hope soon however to procure an Account that may be depended on. In the mean time, as you encourage me to write to you freely, I will inform you of what I judged the most remarkable in the Course of my last Journey.

The Kingdom of *Bohemia* is a fine fertile Country, rich in Metals and Minerals of all Sorts. The Frontiers all round are very high Mountains: The inward Parts of the Country are hilly, with Plains and rising Grounds intermixt, that have the Appearance of being the remaining Bases and Ruins of former Mountains, the Soil being a Composition of decayed Rocks mixed with some vegetable Earth. The Rocks on the highest Mountains are an aggregate Stone of *Lapides Calcarii, Spati, Quartzi, Micæ, &c.* The Plains are covered with the least dissolvable Parts of such Rocks. Their finest Crystals, and precious Stones, are gathered behind the Plough; many still retaining the same Figures they had received at their Formation in the Veins and Hollows of the Rocks. I found on the Tops of Mountains decaying Rocks, which, when mixed with a little vegetable Earth, made exactly the same Soil with that in the rising Grounds and Plains below.

There are several Places in this Kingdom where the Mountains are wholly of *Lapis Scissilis*, which breaks into Rhomboids; and I observed for many Miles the Shelves of this Stone running through
different

different Mountains in the same Direction, facing the South-east, with an Inclination of the Shelves of about 35 Degrees. The Soil here in the Plains is clayey.

Not far from the Frontiers of *Saxony*, in the Mountains, are the famous hot Springs of *Carlsbad*, the Tin-mines of *Schlachtenwald*, and Mines of *Pyrites*, where they prepare Sulphur and Vitriol. As I send you Specimens of the Minerals I met with in these Places, I shall give you also the best Account I can of what belongs to their Production.

Of the hot Springs at Carlsbad.

CARLSBAD is a small Town, situated in an Hollow between two high Mountains: A small River called *Toeple* runs through it from S. E. to N. W. The principal Fountain rises on the North-east Side, about twenty Paces from the River, and about five or six Feet higher than the Surface of the Water. This Spring rises through a square Tube of Wood, whose Diameter is about seven Inches, with a considerable Degree of Violence: Whence it is called the *Sproudle*, or *Furious Fountain*. It comes from the Mountain on the other Side, and passes underneath the River, where the petrifying Quality of its own Water has formed for itself an Aqueduct of *Tophus*, through which it is conducted to this Place. Sometimes this Aqueduct is so filled and choaked up with the *Tophus*, that it bursts into the River, and puts the Inhabitants to a considerable Expence for repairing it. But to prevent this, they bore and clean it every Year near the Fountain. It

forms Rocks of *Tophus* along the Rive-side, composed of *Strata* of several Colours, according as the Water has been impregnated with different Matter, or perhaps from the Difference of Heat or Cold, or the Impressions of the Air at the times of forming the *Lamellæ*. This *Tophus* is hard, and receives a good Polish, and of it they make Snuff boxes, Heads of Canes, and other Toys. Some Years ago, in digging to lay the Foundation of a Church, forty or fifty Paces higher up the Hill, they found vast Quantities of this *Tophus*, which was in many Places so decayed and rotten (resembling very soft Clay), that they were obliged to dig several Fathoms deep, before they could find a solid Foundation. Here they threw out great Quantities of the *Pisolithus*, of the Kinds I send you, which are composed of the same Matter as the *Tophus*, though of a very different Construction: The *Tophus* being made up of Plains joined together, whereas the *Pisolithi* are globular, and composed of several spherical Shells. Some Globules are found above an Inch in Diameter, but more commonly about the Bigness of white Peas, and decreasing gradually in Size till they become as small as fine Sand, and at last common *Tophus*.

The several Shells which compose these Globules differ in Colour as the *Lamellæ* of the other *Tophus* do: But these Shells separate more easily than the *Lamellæ*, and shew that the Colour often consists in one very thin Shell between two thicker ones.

Such kind of *Tophus*, with *Pisolithi*, is found at other Places; but I have never yet met with any body who could give a satisfactory Account of its Formation. Some think the *Pisolithi* are Drops of
Water

Water petrified, as they are found commonly near Falls of Water which is impregnated with the like stony Matter : And as the smallest scattered Drops of Water fly farthest from the Centre, they so account for the gradual Diminution in Magnitude of the *Pisolithi*. Others affirm they grow from the Vapour of this petrific Water, though they cannot tell how.

Amidst this Uncertainty, I derermined, whilst I was on the Spot, to spare no Pains to search after (and discover, if possible) the manner how these regular globous Bodies are produced. I have already told you, that the Waters of these hot Springs at *Carlsbad* are so replete with tophaceous Matter, that where-ever they run, Masses of *Tophus* are formed ; and when these Waters are cold, a Scum (like the little Scales of the same Matter) rises on the Top, some of which I send you, and I believe you will think it, on Examination, little or nothing different from the Substance of the component Matter of the *Pisolithi*, or from that which forms the common *Tophus*, which I suppose to differ from the *Pisolithi* only in Appearance.

First of all, I observed in the Chinks and Hollows of the ordinary Rock-stone very small *Molecule* loosely adhering ; I found also Clusters of *Pisolithi* in the like Places, and on breaking up a Piece of the Rock by the Side of the River, where it had been burst by the Water, I discovered Masses of *Pisolithi* lying in the Chinks, and many loose ones twirling round and played about in the bubbling Water. My Supposition therefore is, that the Stream descending from the Body of the opposite Mountain, passing beneath the River, and afterwards bursting
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out on the Side of the Hill with a considerable Force, could not fail to form Caverns in the Side of the Mountain, and to change its Current as the Passages became choaked up with the tophaceous Matter : And as I found vast Numbers of *Molecule* like Grains of Sand in the Chinks where Water passed, these being washed off might serve for *Nuclei* to the *Pisolithi*, and being kept in continual Motion by the *Vortex* or Whirling of the Water, would acquire a globular Figure, and by receiving new shelly Coats, from time to time, would increase in Bulk, so long as they were sustained, and whirled about in the Water. And as in this Case some would be precipitated sooner, and others later, a Difference in Size must consequently happen, and their Arrangement must be according to their Proportion of Surface and Gravity, till the Place becoming full of such Matter, the Water was obliged to seek out a new Passage. At the Formation of this Kind of *Tophus* in the Caverns, some intervening Accidents from the Motion of the Medium, the Influence of the Air, and other concurring Causes, have sometimes so far prevented a compact and firm Conjunction of the component Particles, that in several Places it seems in a decaying State; and is even soft as Clay. In the Air indeed it grows again somewhat harder, but then it is porous and light: And they call it *Sprondle Sand*. The Inhabitants of a House near the Church have a Hollow, out of which they take this, and sell it for the scouring and polishing of Silver, &c. In this Hollow it is very warm and suffocating, especially in rainy Weather, and then there rises from it a strong Vapour.

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On the other Side of the River, at the Foot of the Mountain, are a good many Houses, and a broad Street ; cross under which the Stream runs, and in the Winter no Snow lies on the Place where it passes. Some Rooms in a House built here are always warm like a Bagnio, and in one of the Cellars may be heard the Noise of the Water running under Ground. Along this Side of the River are several hot Springs, which differ in Quality from one another, as well as from the Water of the *Sproudle*. The Principal of these is called the Mill-Fountain (from its being near a Mill) which is much used, and reckoned milder than the *Sproudle*. It is not near so saturated with the limy Matter, and forms scarce any *Tophus*.

These Springs either have different Origins, or else the great Stream divides in the Body of the Mountain into several Branches ; which, according to the Nature of the Passages they run through, or from the different Thickness of their Columns, and the Velocity they move in, are impregnated with different Matter, and when cold precipitate more or less Calx ; but their Salts are the same, nor is there much Difference in the Quantity they yield. The *Sproudle* is so full of the stony Matter, that any thing laid into it is covered over with a thick Tophus in a few Days. When the Water is taken up, and let stand a little in the Air, it incrusts the Vessels that contain it, and its Surface is covered with a Scale, like Lime-water, which is made Use of as a Dentifrice.

I don't propose to inform you of the medical Virtues of these Waters, nor to enter into physical Accounts of their Origin : I have only in view to satisfy you about the Formation of the Specimens I send you.

Most of the Rocks about *Carlsbad* are an Aggregate of *Spatum*, *Mica*, *Quartzum*, *Rubrica*, cum *Matrice Lapidis Calcarii*, and cleave into Rhomboids. The Soil on the Side of the Mountain is made by the Dissolution of such Rocks intermixed with some vegetable Earth; and the whole Surface is covered with the least dissolvable Parts, often adhering together in Masses by the Intervention of a limy Matter like incruusted *Spatum*. And I found higher up the Mountain some Rocks mounding into such Soil.

The *Carlsbad* Waters give a good deal of neutral Salt by boiling and crystallizing. From 1080 lb. of Water xxii Ounces of pure Salt. I send you some which I prepared myself, suspecting the Apothecary might adulterate it to increase the Quantity.

My Thermometer being broke, I procured one of a Friend: But not knowing of what Construction it was, I tried it in the following manner: In melting Ice the Mercury fell to $28 \frac{1}{2}$ of its equal Parts, and by the Heat of my Body it rose to 66 of those Parts. This Thermometer held into the *Sprondle* Fountain rose by its Head to 96, and in the Mill-Fountain to 67.

About twenty Miles from *Carlsbad* to the South-west near the Town of *Eyra*, is a cold Spring of Mineral Waters, much in Use in these Countries. This gives also a Salt much of the same Kind. To the South from *Carlsbad* about twenty five *English* Miles are likewise several cold Springs: One of which is much richer in this same Kind of Salt than the former. It belongs to the Monastery of *Toeple*. In the Winter, when they boil this Water, from x lb.
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of Water they get sometimes above an Ounce of Salt. They prepare here a neutral Salt, by adding a mineral Acid, or perhaps some other neutral Salt (but the Preparation they keep a Secret) which makes it shoot into beautiful Crystals. It is called *Sal Medium Toeplicense*, and is sold in many Places of Germany. I send you Specimens of all these. On exposing these Salts some time to the Air, they fall into a *Magnesia*, but dissolving and crystallizing them again recovers them; tho' the oftener they are dissolved, the Crystals shoot the smaller.

About seven Miles South-west from *Carlsbad*, at *Altsettle*, are Mines of black *Schistus*, and formerly they made a great deal of Alum and Vitriol from it; but it is now neglected, as they find in the same Mines Plenty of *Gleba Pyriticosa*, from which they distil Sulphur. Six hundred Weight of this *Pyrites* give one of Sulphur: And the Oven makes from one to two hundred Weight per Week. The Residium being thrown in great Heaps in the open Air, takes Fire, and constantly smokes. This Matter they throw into large Reservoirs of Water, which afterwards they let run off into the Boiling-House, and so make Copperas.

About nine *English* Miles to the South from *Carlsbad*, are the Tin mines of *Schlachtenwald*. They reckon this Mine has been wrought near 500 Years. There are five Entries, four whereof are provided with Machines for hoisting the Barrels with the Tin Stone: The fifth is for drawing the Water out of the Mine. The Number of Miners who work below Ground are 90: Each Man delivers 25 Barrels of this Stone per Week, and receives

something less than Half a Crown Wages. They have different Inventions in the Mine for splitting the Rock, but the most effectual one is bursting it with Gunpowder. The whole People employed in these Mines are about 300. The main Body of the Mine is nearly 700 Feet in Diameter, and from this go several East and West; for so the Mineral runs. The broadest of these Ways is about two Feet, and the Mineral in these Veins is richer than what is found in the main Body of the Work, whose greatest Depth is 650 Feet. The Tin-stone is first burnt in Kilns, which they say betters the Tin considerably, and makes it much more easy to stamp. After this Preparation it is brought to the Stamp-mills, where by stamping it becomes like grey River Sand, which they wash and separate the Tin from in the following Manner. They throw it by Shovels-full into Basons where there passes a Current of Water, and by keeping of it stirring it runs over by a broad Conduit descending by Steps, which are covered with coarse Linen Cloth; and by this Operation the Sand is washed away, and the Tin remains on the Cloth in Form of a black scaly Powder, and dried is fit for Melting. One hundred Weight of the Stone gives only three Ounces of Tin; and 150 lb. of the clean-washed Tin-mineral give 140 lb. of Tin. There are ten Melting Ovens, each whereof can melt nine or ten hundred Weight in twenty-four Hours; the Breadth of these Ovens within side is eight or nine Inches, and from ten to twelve Feet long, blown by two Pair of Bellows. The Proportion of Charcoal to the Metal is near an equal Weight. They are thrown into the Oven by Degrees, alternately :
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The Residuum they melt three times over, which always yields new Metal. They make here about 800 Centers *per Annam*, which is sold from fifty-three to fifty-six Imperial Gouldens *per Center*. They find sometimes the black and sometimes the white crystal Mineral in Nests, or Clusters: The *Stannum Poledron Nigrum* is a very pure and rich Tin Ore: They say the white is rich also, but 'tis so hard and difficult to melt, that the Tin is burnt to an Ash before it can be brought to Fusion.

Near *Geffries*, in *Bareith*, they boil Vitriol. The Mineral from which they make it, is a black *Schistus*, some of it too is brown. It has several small Veins of Pyrites in it. When first taken out of the Pits it has no Taste, but after it has been exposed some Time to the Weather, and begins to moulder, it acquires a very sharpe Taste. It is laid in great Heaps, under which there are Cisterns for receiving the Water that runs from it after Rain, or that they pump upon it when the Weather is dry. This Water is conveyed by Conduits into the Boiling-House, where there are two Leaden Kettles, in which it is boiled to a strong Ley, and then let off into Reccivers where it shoots. These two Kettles make from eight to nine hundred Weight *per Week*, which is all wrought by two Servants: It not having been found necessary to add any new Mineral to the Heaps these fifteen Years past, as they assured me. But as the Quantity of the Mineral consumed in that Time is not known, it is impossible to determine how much of this Salt has been supplied by the Air. They only add to the Quantity half an hundred Weight of Iron, which is consumed in the Kettles

every Week, and makes it shoot into Copperas ; but in Place of this, if they add Copper, it makes blue Vitriol. Formerly they made Alum here likewise from the same Ley, only instead of Iron or Copper they added Pot-Ash and Urine : But the Expence of the first, and the Difficulty of getting the other in sufficient Quantity, has made them leave off making Alum here for some Years past.

Of the Salt-mine^s near CRACAU.

NEAR *Cracau* in *Poland* are famous Salt Mines, of which I shall give you a short Account, as well as of the most remarkable Things I found there. The Town is situated near the Foot of a vast Chain of Mountains, and from it, passing by Hills and rising Grounds about two *German* Miles Southward, I came to the Mines of *Vilitzsa*. These are in a Hill flat and irregular above, surrounded with Hollows and Vallies, and to the South there is a neighbouring Hill much higher. The Mine has ten Entries, which are provided with Horse-Engines, whereof seven are for hoisting up the Salt, and the rest for drawing Water from the Works, and for the Descent and Ascent of the People. I entered the Mine by winding Stairs of 484 Steps, which brought me to the first Story. The Descent into the second is by strait Stairs of 133 Steps. Into the lowermost Story there are no Stairs, but eighteen Ladders from different Floors, which make together 300 Feet ; and the computed Depth of the Whole is about 900 Feet perpendicular.

The several Strata of the Earth are as follow.—
On the Surface is a common clayey Ground, next is
pure

pure Clay, and then a Bed of soft, moist, black, slimy Earth; and below this are Hills of a Kind of Earth without any Mixture of Grit or Sand. Here are first found Particles and Veins of Salt; and, descending a good Way through this and some Salt Rocks, we enter into the first Story, where there are a great many Alleys and Cross-ways (which are run out to considerable Distances), and many large Caverns, out of which Salt has been cut. Here the Floor, Walls, and Cielings, are solid Salt Rock. As the Religion of the Country is *Roman* Catholic, there are several large Chapels, with Altars adorned with Columns, Crucifixes, Statues of Saints, and other Ornaments in that Way, hewed out of the Salt Rock, and well wrought in different Orders of Architecture. Some of these, which are of the purer Salt, and not much smoked with the Torches that the Workmen use in the Mine, have a very beautiful Effect. In some Places the Sides of the Alleys, and some of the great Vaults, are lined and doubled with Timbers, where they thought the Pillars of Earth or Salt left for supporting the superior Weight might prove too weak. I observed in one Place, that a Sinking of the Earth some Years ago had crushed some of the Baulks almost flat, and made a Rent in the Salt Rock on the other Side, about nine Inches wide.

Notwithstanding there is no Remembrance or Tradition of any remarkable Accident by the Falling-in of these Mines, yet they have lately discovered a Wooden House, which must have been swallowed in very long ago. These Mines were on Fire in the Year 1644. but this Accident must have happened long before that time; for they have a Plan of these Works, taken about 200 Years ago, with Remarks
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of every thing that was curious in all three Contignations ; but no mention is made of this House, nor is there any-thing in the Registers of these Works that shews it to have sunk in since. The Wall of this House is seen at the Side of one of the Cross-ways : They have found Plates, Spoons, and some other Things of Metal ; but they make no farther Search, as the Pains would exceed the Profit : So it is left as a Curiosity.

Notwithstanding the Salt Rocks are on all Sides, and the Earth that is among them is full of Veins and Particles of Salt, there is a Spring of very good fresh Water, which is the Drink of the thirsty Workmen, and of the Horses employed below-ground. This Source comes from above ; but directly over that Place, on the Surface, there is no Well, nor springy Ground, only it is hollow.

They find in these Mines Alabaster, *Glacies Mariæ*, *Gypsum*, and sometimes *Pectines*, or small Sea-shells : But the most remarkable Thing of all is, in the Middle of a vast Salt Rock, a large Tree is found, with all its Branches incased in it, lying horizontally. I send you a Piece of it, which I hewed out of the Rock myself. It seems to be a Beech-tree, of which there grow Plenty in these Countries at present.

From the upper Story the Rocks grow broader like Cones, and the deeper they go, the Salt is always finer, and less mixed with Earth : But it is not yet known how deep they run. They do not however find it turns so much to Account to work the lowermost Story, though it is all pure Rock, the Hoisting being more expensive than the running out Cross-ways, and working the upper Stories. The
Rocks

Rocks have Roots or Veins, which shoot into the Earth on all Sides, some in strait Lines, others in Zigzag, even to the Distance of Seventy Feet; whereby the Miners are often directed to the Body of the Rock. These Veins are very white and clear, yet they make no Use of what is found in them, being impure, and mixt with other Salts: It likewise dissolves much easier than the true Salt. *Sal Gemmae* is found in Veins and Nests in several Places of the Mines, but 'tis often very troublesome to hew, and get it out of the other Salt Rock. Here are no Wells of *Naphtha*, but there are some Cavities where the Air is so inflammable, that some, by going rashly into such Places with a Light, have been damaged by the Fire, and even run the Risque of their Lives. This only happens in Places where the Air has no free Admission; for in all the main Streets and cross Ways there is a considerable Draught of Air thro' the Ten Entries: And, in the Winter, while it is a strong Frost, and quite calm Weather, there reigns a very strong Wind in the Mines: But stormy Weather makes no Alteration; and in the Summer there never happen any such Changes.

From the several Ways are Entries into the Chambers or Vaults where they work. They hew the Sides of the Wall into large square Columns, the Height of the Room, and about Two or Three Feet thick. By driving their Wedges in behind these Pillars, they make them rend from the Rock, and their Fall on the Floor makes a very great Noise. The Workmen are so accustomed, that by the Sound of their Blows they know the Instant it is going to fall, and get out of the Way accordingly. Sometimes they

they hew the like Pieces from the Floors.— These Pillars are again hewed into Blocks, from Three to Six Feet long, according to their Thickness. They are drawn up, and transported in such Pieces, and the small in Barrels.

The Quantity of Salt dug here yearly, comes to about 120,000 Centeners of *Vienna*: and the whole Expences for Officers, Workmen, Materials, &c. amount to about 100,000 Dollars. The Number of Workmen of all Sorts make about 600 Persons: They are very healthy and long-lived, not subject to the Scurvy, or any particular Distempers. The Officers on the contrary are very subject to Diseases of the Breast, and Consumptions, which is probably owing to the frequent Changes of Air they meet with, their Business obliging them to stir about much, both above and below Ground, where the Air is very different.

These, Sir, were the most material Observations I was able to make in the Progress of our long March, amidst my daily Cares and Fatigues in the Duties of my Profession. I shall from time to time give you Accounts of whatever I think remarkable, and if you, or any Gentleman of the Royal Society shall favour me with any Inquiries concerning the Productions of this Country, I will return the most satisfactory Answer in my Power. I hope to hear of your receiving this, and am,

Sir,

Your most humble Servant,

JAMES MOUNSEY.